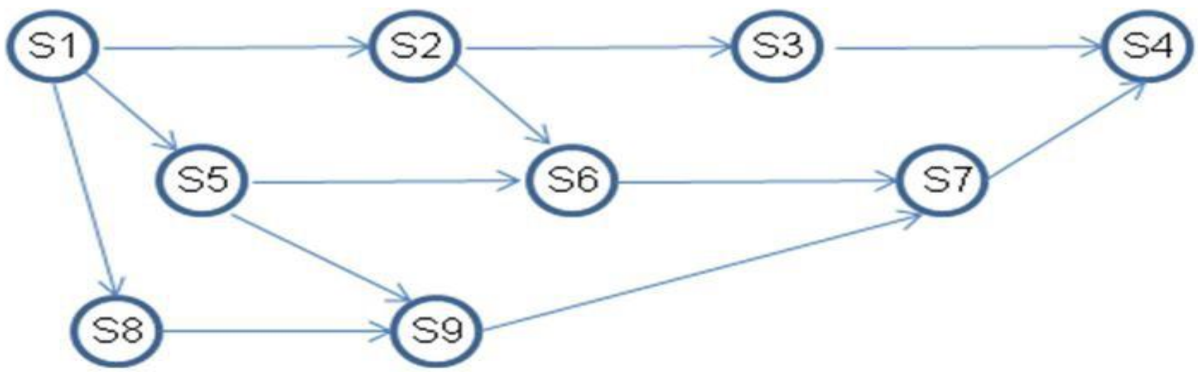
COEN -283
Operating Systems
FALL 2015
Assignment 2 - IPC and Scheduling

Ques 1: (30 points)
Assume you are given the following wait-graph that represents the relationship between multiple threads (s1,s2,s3,…). An arrow from one thread (Sy) to another (Sx) means that thread Sx must finish its computation before Sy starts. (For example: S1 has to wait for S2,S5,S8 to finish, S2 has to wait for s3,s6 to finish and so on.)
Use semaphores to enforce this relationship specified by the graph. Be sure to show the initial values and the locations of the semaphore operations. You will be marked based on finding the best solution with minimum number of semaphores.



Ques 2: (10 points)

What is the meaning of the term busy waiting? What other kinds of waiting are there in an operating system? Can busy waiting be avoided altogether? Explain your answer.

Ques 3:
(30 points) The following pair of processes share a common variable X:

	Process A	**Process B**
L1:	int Y	int Z
L2:	Y = X*2	Z = X+1
L3:	X = Y	X = Z

X is set to 5 before either process begins execution. As usual, statements within a process are executed sequentially, but since no assumptions can be made regarding each process's speed of execution, statements in either process may execute in any order with respect to statements in the other process.

(a) How many different values of X are possible after both processes finish executing?

(b) Suppose the programs are modified as follows to use a shared binary semaphore S:

	Process A	**Process B**
L1:	int Y	int Z
L2:	Wait(S)	Wait(S)
L3:	Y = X*2	Z = X+1
L4:	X = Y	X = Z
L5:	Signal(S)	Signal(S)

S is set to 1 before either process begins execution or, as before, X is set to 5. Now, how many different values of X are possible after both processes finish executing?

(c) Finally, suppose the programs are modified as follows to use a shared binary semaphore T:

	Process A	**Process B**
L1:	int Y	int Z
L2:	Y = X*2	Wait(T)
L3:	X = Y	Z = X+1
L4:	Signal(T)	X = Z

T is set to 0 before either process begins execution or, as before, X is set to 5. Now, how many different values of X are possible after both processes finish executing?

Programming Question

Ques 4: (30 points)
Solve the dining philosopher's problem using monitors instead of semaphores.